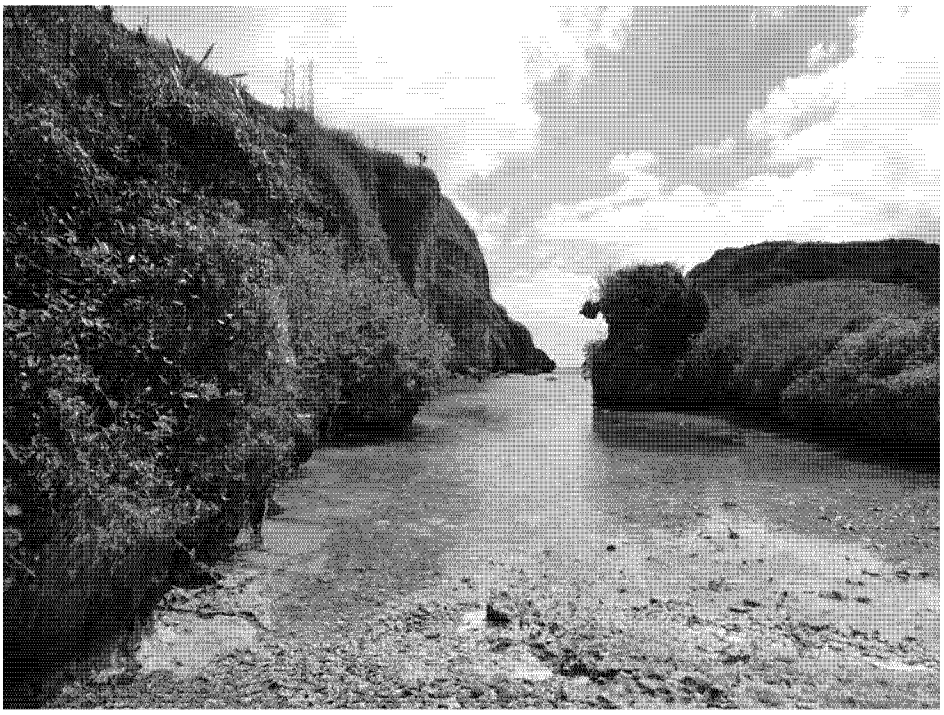
FINAL

ESTABLISHMENT REPORT

OROTE ECOLOGICAL RESERVE AREA EXPANSION



Prepared by:

NAVAL FACILITIES ENGINEERING COMMAND MARIANAS

September 2013

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ESTABLISHMENT REPORT
for
OROTE ECOLOGICAL RESERVE AREA EXPANSION

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NAVAL FACILITIES ENGINEERING COMMAND MARIANAS

DESIGNATION ORDER

As Chief of Naval Operations (N45), I hereby propose adding approximately 112 acres to the existing Orote Ecological Reserve Area, including 32 acres of terrestrial habitat and 80 acres of submerged land. The lands described in this report shall herafter be administered as an Ecological Reserve Area.

_____ _____

Date Chief of Naval Operations (N45)

CONCURRENCE PAGE

The Establishment Report for Orote Ecological Reserve Area Expansion provides the justification to add approximately 112 acres to the existing Orote Ecological Reserve Area, including 32 acres of terrestrial habitat and 80 acres of submerged land. By their signatures, or an enclosed letter of concurrence, all parties endorse this proposal.

Approving Officals:

_____ _____

Rear Admiral T.D. Payne
Commander Navy Installations Command
Joint Region Marianas

Date

_____ _____

J.M. Ward
Commanding Officer Naval Base Guam

Date

_____ _____

Anne Brook
NAVFAC Marianas Conservation Program Manager

Date

EXECUTIVE SUMMARY

Commander, Joint Region Marianas proposes to expand the existing Orote Ecological Reserve Area (ERA) by 112 acres (46 hectares) on Naval Base Guam (NBG). Expanding the Orote ERA will achieve compliance with several regulatory agency requirements. The Orote ERA expansion is a conservation measure associated with the Biological Opinion for the Relocation of the U.S. Marine Corps from Okinawa to Guam and Associated Activities on Guam and Tinian (BO 2010-F-0122) and Army Corps of Engineers permit mitigation for the 2008 Kilo Wharf Extension (Federal Register / Vol. 73, No. 6) at Apra Harbor Naval Complex. This proposal follows the Guidelines for Establishment of Ecological Areas on Naval Installations (NAVFAC 1996) and demonstrates meeting the objectives of protecting ecosystems of physical or biological phenomena, providing research and educational opportunities, and preserving a full range of biological diversity. The proposed area also provides nesting beaches for federally listed sea turtles, has Guam's highest known population of *Heritiera longipetiolata*, a rare endemic plant listed as endangered by the Government of Guam (GovGuam), and provides coral communities that are diverse and healthy compared to other sites on Guam (Paulay et al. 2001 and SWCA 2009). The protection of these resources will help to preserve Guam's natural ecology and support Joint Region Marianas (JRM) ecosystem based management objectives as described in the Integrated Natural Resources Management Plan (INRMP). The 2013 JRM INRMP includes the proposed expansion area for long term ecosystem based management and discusses studies and projects to meet the overriding goal of restoring and enhancing habitats for native species. Furthermore, the proposed expansion area is compatible with the military mission at Orote Peninsula since there are safety arcs that limit unauthorized access to the area.

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1 OVERVIEW

An Ecological Reserve Area (ERA) is an area dedicated primarily or exclusively to preserving examples of ecosystems and genetic diversity and providing scientific research and education on ecological and environmental problems. These special natural areas include characteristic or outstanding botanical, ecological, geological, and scenic features or processes. An ERA is a physical area or biological unit in which current natural conditions are maintained insofar as possible. These conditions are ordinarily achieved by allowing natural, physical, and biological processes to prevail without human intervention. However, under unusual circumstances, deliberate manipulation (e.g., removal or control of invasive species) may be utilized to maintain the unique feature that the ERA was established to protect (NAVFAC 1996).

Orote ERA was established on March 13, 1984 and includes 163 ac (66 ha) of Navy property on Naval Base Guam located on Orote Peninsula extending from the former Orote Landfill on the east to the tip of the Orote Peninsula on the west, spanning about 1.9 miles (3 kilometers) of shoreline (Figure 1). The terrestrial unit (TU) encompasses approximately 30 ac (12 ha) of limestone cliffs. The marine unit (MU) is comprised of approximately 133 ac (54 ha) of submerged lands from the shoreline to a depth of 120 feet (37 meters) offshore. The Orote ERA extends inland from the mean lower low water line to the upper edge of the cliff along the southwestern edge of Orote Peninsula.

In 1994, the TU of the Orote ERA became part of the Guam National Refuge Overlay unit (see Figure 1). The Overlay unit is managed in cooperation with the US Fish and Wildlife Service (USFWS) to protect federally threatened and endangered species and their habitat (USFWS memo dated March 25, 1994). Cooperative Agreements (CA) between the USFWS and the U.S. Navy and U.S. Air Force, dated March 4, 1994 and March 10, 1994, respectively, established the Overlay and defined the management roles and responsibilities of the agencies.

1.1. Purpose and Scope

Commander, Joint Region Marianas proposes to expand the existing Orote ERA to encompass Orote Island, Adotgan Point and the Spanish Steps area on Naval Base Guam (NBG) (Figure 2). This proposed expansion would increase the current Orote Ecological Reserve Area by approximately 112 acres (46 ha). The Orote ERA TU would be expanded by 32 acres (13 ha) to include the beaches, small islets in the cove between Orote Island and the main peninsula, and the limestone forest area inland of the TU, including the 8.2 ac (3 ha) Orote Island and the 24 acre (10 ha) of cliff line at the north tip of Orote Peninsula. The MU would be expanded by 80 ac (33 ha) from Orote Point to Adotgan Point, and would include the waters around Orote Island to a depth of 120 feet (37 m).

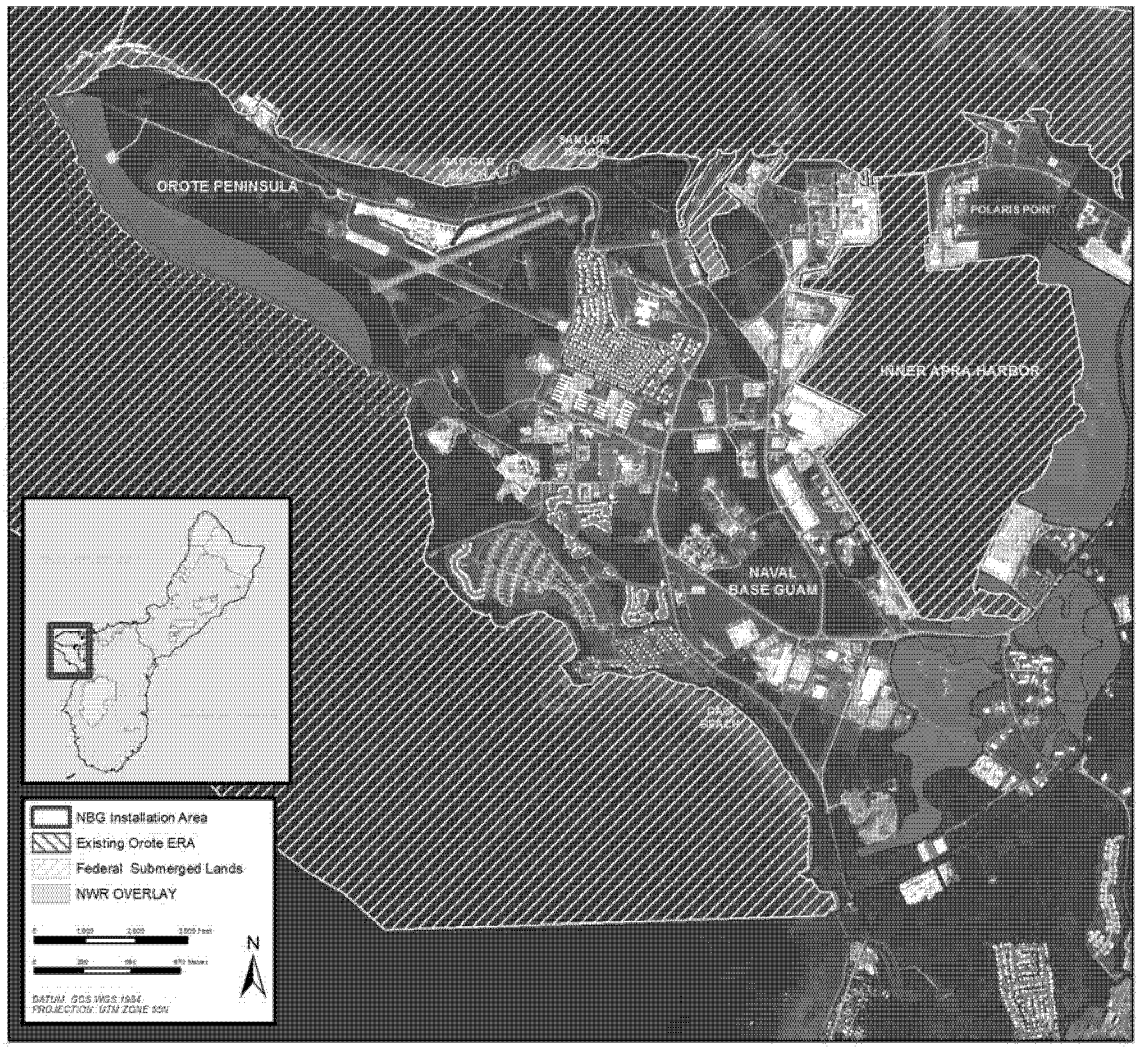


Figure 1. NBG Location Map, Orote ERA, and the Overlay Unit

This expansion proposal is a conservation measure associated with the Biological Opinion for the Relocation of the U.S. Marine Corps from Okinawa to Guam and Associated Activities on Guam and Tinian (specifically for the TU)(BO 2010-F-0122), an Army Corps of Engineers permit contingency mitigation for the 2008 Kilo Wharf Extension at Apra Harbor Naval Complex (for both the TU and MU) and is included in the 2008 Record of Decision for Kilo Wharf Extension (MLCON P-502) (Federal Register / Vol. 73, No. 6).

1.2 Authority

Authority for the establishment of an ERA is OPNAVINST 5090.1C CH-1, Chapter 24, dated 18 July 2011.

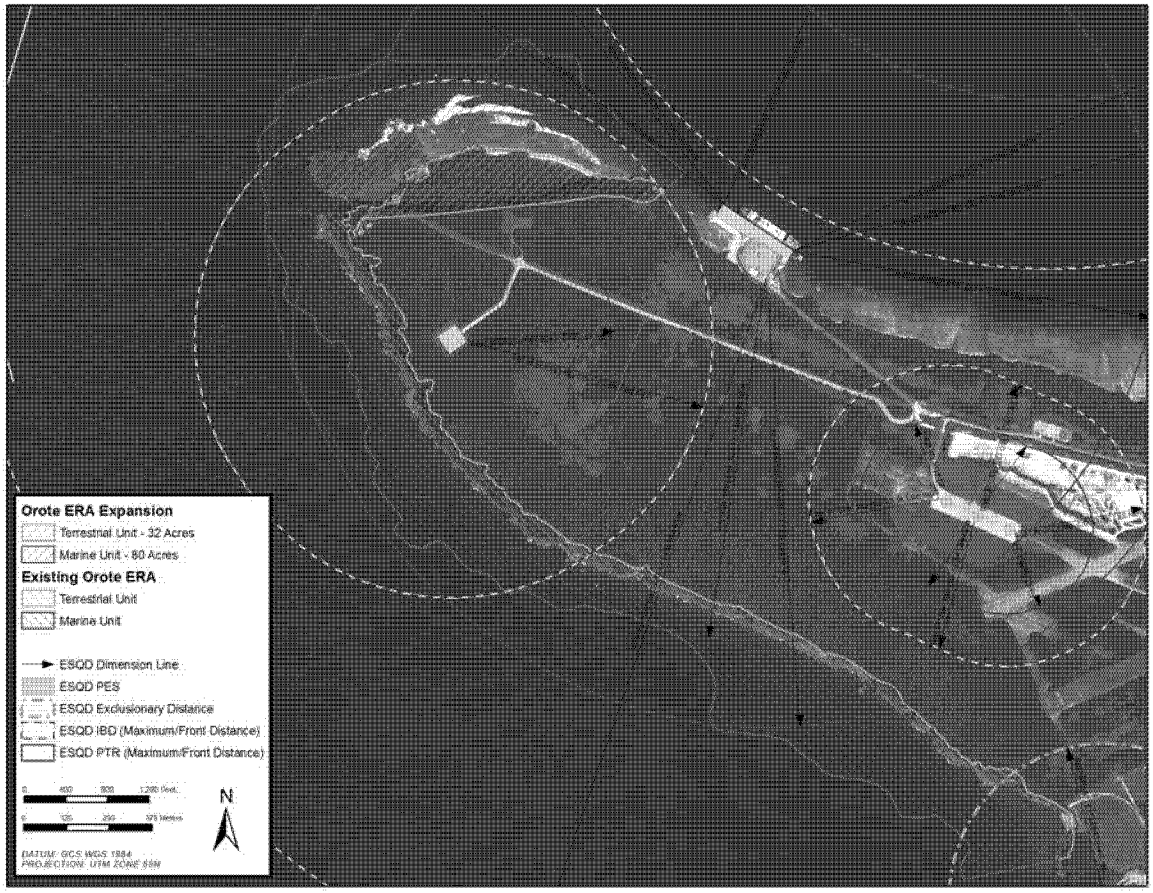


Figure 2. Boundaries of Orote ERA and the Proposed Expansion (TU and MU)

1.3 Vision, Goals and Objectives

The proposed Orote ERA expansion will result in the enhanced management and conservation of natural resources on Navy lands while supporting JRM's mission through the following goals and objectives:

- Serve as a long-term in-place conservation to allow the Department of Defense (DoD) to meet mission requirements while complying with environmental laws
- Protect examples of ecosystems of physical or biological phenomena
- Provide research and educational opportunities
- Preserve biological diversity

Aerial view of the proposed Orote ERA expansion area showing Orote Island, Adotgan Point, and Spanish Steps area (Photo courtesy of Guam DAWR 2006).

The Guidelines for Establishment of Ecological Areas on Navy Installations (NAVFAC 1996) states that criteria for designation include:

- Area shows no evidence of disturbance by man for at least the past fifty years
- Area contains typical or unusual faunistic or floristic types, association, or other biotic phenomena or characteristic or outstanding geologic, pedologic, or aquatic features or processes
- Area must be large enough to provide essentially unmodified conditions in their interior portions
- Area must not have any permanent physical improvements
- Area should be protected against activities that directly or indirectly modify ecological processes

Table 1 demonstrates how the proposed Orote ERA expansion area meets the criteria for designation based on the guidelines.

Table 1. Proposed Orote ERA Expansion Criteria Discussion

Criteria	Discussion
Evidence of Disturbance	Although Orote Peninsula was disturbed during WWII, the proposed expansion area has only been affected slightly by human activities since the 1950's. The Spanish Steps area is a recreational beach site that can only be accessed when Kilo Wharf is not in use and little disturbance by humans for the past fifty years has been detected. The trail leading from the cliff line to the beach is relatively unimproved except for stairs at the top of the cliff line. Guam's ecosystems throughout the island have been disturbed by invasive species which has altered the natural habitat.
Unusual Characteristics	Orote Island was once geologically attached to Orote Peninsula. It supports Guam's highest known population of *Heritiera longipetiolata*, a rare endemic forest tree species. The shoreline along the north part of Orote Peninsula has known nesting sites for sea birds and federally listed sea turtles and has one of the most pristine beaches on Guam.
Size	The proposed expansion area more than doubles the current TU from 30 acres (12 ha) to 62 contiguous ac (25 ha) and provides continuous protection from disturbance and habitat fragmentation.
Physical Improvements	This area lacks major improvements. There is an existing metal staircase leading down to Spanish Steps and some ropes to allow limited access.
Protection	The area is frequently encumbered by safety arcs generated from Kilo Wharf making visitation highly restricted.

1.4 Achieving Success and No Net Loss of Military Mission

ERAs on Navy lands must be conducted in a manner that does not hinder or impair the installation's mission. Ideally, management decisions will intergrate military land use

and sustainability of the environment. The goal is to achieve no net loss to the military mission with no or minimal loss of environmental resources. This goal can be reached if natural resources managers and operations personnel work together to plan mission-related activities such as construction, land development/use, and training exercies so that environmental protection/preservation is part of the design rather than a secondary consideration.

1.5 Roles and Responsibilities

1.5.1 Joint Region Marianas

NAVFAC Marianas provides the oversight and support for the development, maintenance, and implementation of the natural resources programs for JRM.

1.5.1.1 Naval Base Guam

The NBG Commanding Officer (CO) is the administrator of the Orote ERA. NAVFAC Marianas, through the Environmental Division of the Public Works Office, is responsible for the management of the existing Orote ERA and will be responsible for management of the proposed Orote ERA expansion to ensure no permanent structures will be constructed, verify no interference occurs with normal cycles and fluctuations of plant or wildlife populations, control public access, and enforce other restrictions. Research approvals must be obtained from the CO.

1.5.2 External Stakeholders

1.5.2.1 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) has responsibility for the welfare and protection of endangered and threatened species, migratory birds, and certain anadromous fish occurring in the United States, its territories, and possessions. The Division of Ecological Services staff provides technical assistance regarding invasive species threats and biosecurity issues as they relate to threatened, endangered, and species of concern (TES) under the Endangered Species Act, Section 7 (*consultation, listing, recovery, and habitat conservation planning*); Clean Water Act (CWA) permitting; NEPA analysis; and management of environmental contaminants. The Division of Law Enforcement enforces Federal and international laws and treaties that protect TES and migratory birds.

1.5.2.2 National Marine Fisheries Service

The National Marine Fisheries Service (NMFS) is the lead Federal agency responsible for the stewardship of the nation's offshore living marine resources and their habitat. The mission of NMFS is to ensure healthy fisheries and marine habitats exist for the benefit of all Americans by managing, conserving, and protecting fish, whales, dolphins, sea turtles, and other living creatures in the ocean (NOAA 2011). NMFS works within the Magnuson-Stevens Fishery Conservation and Management Act (MSFMCA), the Marine

Mammal Protection Act of 1972 (MMPA), and the Endangered Species Act (ESA) of 1973, as amended to fulfill its mission of promoting healthy ecosystems.

The USFWS and NMFS share jurisdiction over sea turtles that are listed as endangered or threatened under the ESA. The USFWS has jurisdiction over sea turtles when they come ashore, while NMFS retains management control while sea turtles are in the ocean. In addition, both agencies enforce Federal laws concerning wildlife trade in endangered species. NMFS also maintains law enforcement personnel on Guam to enforce certain provisions of the MMPA, the ESA, and the MSFMCA.

1.5.2.3 Guam Division of Aquatic and Wildlife Resources

Guam Division of Aquatic and Wildlife Resources (DAWR) is the leading Government of Guam (GovGuam) agency responsible for fisheries, wildlife, and other natural resources management on Guam. DAWR has an active natural resources management program that includes research on the natural history of endangered species; recovery of endangered species; captive breeding and release of the endangered Guam Micronesian kingfisher (*Todiramphus cinnamomina cinnamomina*), Mariana crow (*Corvus kubaryi*), and Guam rail (*Gallirallus owstoni*); monitoring of endangered species populations and trends; wetland studies and delineations; control of invasive species, including research into the control of the brown treesnake (*Boiga irregularis*); fisheries surveys and management; sea turtle monitoring; environmental education of the public; public hunting and game management; consultations for the protection of TES and their habitats under the ESA; and other programs. DAWR administers several conservation areas, including Bolanos, Cotal, and Anao, and has concurrent jurisdiction over non-DoD submerged lands on Guam in accordance with 48 U.S.C. § 1704. Conservation Officers with DAWR have some jurisdiction on Federal lands for the enforcement of Guam wildlife laws. Guam Conservation Officers have also been deputized by the USFWS and are authorized to enforce Federal fish and wildlife laws.

1.6 ERA Integration with the JRM INRMP

The JRM INRMP discusses the proposed Orote ERA expansion stating that the existing Orote ERA will increase by 112.6 acres. It details the oversight JRM will have on the Orote ERA. The management plan for the Orote ERA will be modified to include the proposed expansion area. The JRM INRMP includes long-term ecosystem based projects to ensure that JRM continues to meet the overriding goal of restoring and enhancing habitats for native species, including listed TES, over the next 30 to 50 years.

2 MILITARY MISSION

The mission of NBG is to support the U.S. Pacific Fleet and other forces operating from, serviced by, or supplied through Guam; to support the military personnel based or attached to tenant commands on Guam; and to support the families of sailors stationed in Guam. Kilo Wharf is located on Orote Peninsula and is the DoD's only dedicated ammunition wharf in the Western Pacific Region. The wharf provides ammunition

loading and unloading capability in direct support of DoD strategic forward power projection. Kilo Wharf generates Explosive Safety Quantity Distance (ESQD) arcs which limit access within the arc(s) while the wharf is in use. The designation of the proposed Orote ERA expansion is compatible with current and future military training and operations.

3 LAND USE

3.1 History and Pre-Military Land Use

A number of researchers have conducted archaeological/historical investigations on Orote Peninsula (McCoy et al. 1978, Craib 1992, Craib and Yoklavich 1992a, b, Carucci 1993, DeFant et al. 1995, Fulmer et al. 1999). Identified sites span the range of Guam's history. Prehistoric sites have been identified on coastal strands on both the ocean side and harbor side of the peninsula, and on the plateau.

A prehistoric cave complex near the water at the tip of Orote Peninsula shows evidence of long and continuous use dating to the Pre-Latte period 3,500 B.C. to 500 A.D. (NAVFAC File photo)

Historic sites include the remains of forts, wells, stairs, and villages from the Spanish period, maritime structures from the American and Japanese periods, and extensive remains related to the massive development of the peninsula by U.S. Forces following the liberation of Guam in 1944.

Photo of Orote Peninsula circa 1945 (U.S. National Archives)

3.2 Military Land Use

Operations on NBG are very diverse and include several critical mission requirements. The primary function of NBG is to support fleet units and operational forces of the Fifth and Seventh Fleets. NBG operates three wharfs, Kilo, Delta, and Echo, which are located in Outer Apra Harbor. Uniform, Tango, Victor and Whiskey wharfs operate within Inner Apra Harbor. Berthing of vessels requires adequate water depth (approximately 35 feet [11 m]), ESQD arcs, and security around the vessels while in port.

Shore-based support includes warehouses, power, water, sewage treatment, fuel transfer, and other facilities. NBG also supports military housing areas, recreational facilities, food services, commissary, and a Navy exchange. NBG is also home to Camp Covington which supports Naval Mobile Construction Battalions (SeaBees).

Training at NBG includes beach landing sites for amphibious assault vehicles (AAV), landing craft air cushion (LCAC), and landing craft utility (LCU); operational training sites for small unit maneuvers, rappelling, helicopter insertion and extractions, rapid runway repair, and field exercises; and range activities at a small arms range, pistol range, stress course, sniper range, fire and maneuver range, and a skeet range. Training within Apra Harbor includes explosive ordnance disposal (EOD), deepwater mine countermeasures, helicopter paradrops, helicopter cast and recovery, drown-proofing, heliborne firebucket (offload), helicopter search and rescue, and combat swimmer (JRM 2013).

Authorized military training activities periodically utilize the Orote Peninsula. Orote Peninsula serves as the U.S. military's main ordnance port in the western Pacific; the Kilo Wharf is Guam's only ordnance wharf. Improvement to ordnance handling on the peninsula with the expansion of Kilo Wharf was completed to service a new class of ammunition ships (Federal Register 2008).

The use of the Orote ERA is constrained by ESQD arcs that preclude inhabited buildings and place extreme limits on the types of allowable uses. The Orote Peninsula small arms range, situated north of the Orote ERA on the plateau, is periodically used for security drills and weapons re-qualification activities. The two dimensional surface danger zone (SDZ) is oriented northwest over the Orote ERA (Figure 2).

3.3 Regional Land Use Context

Residents of Guam depend primarily on the U.S. military and tourism for their economy. The tourism industry has grown rapidly, creating a construction boom for new hotels, golf courses, and other infrastructure. Nearly 1.2 million tourists visit Guam each year including about 962,000 from Japan and 114,000 from Korea (JRM 2013). As tourism continues to grow, more and more land will be developed to support the industry. In addition, with the proposed military relocation on Guam, more development of military facilities and island infrastructure will be needed to support military and associated civilian personnel.

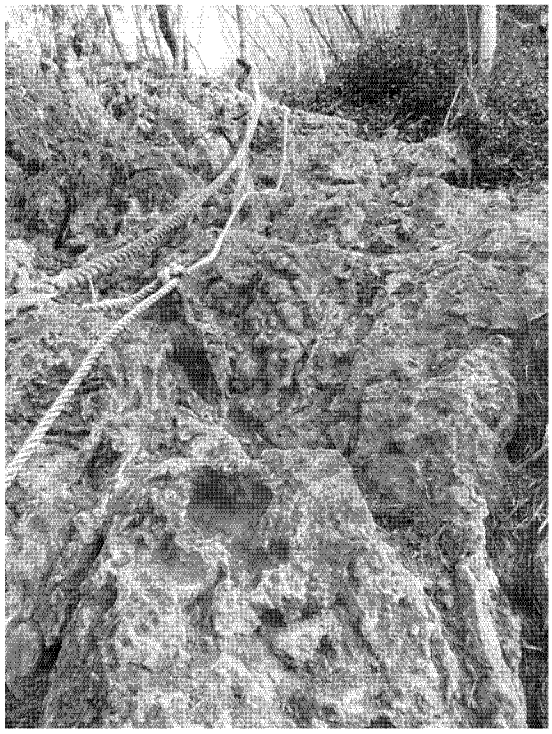
3.4 Sustainability and Compatible Use

No development would be allowed in the proposed Orote ERA expansion due to security and natural constraints. The steep limestone cliffs and sandy beaches also impede development.

Access to Orote Peninsula is controlled by the Commanding Officer (CO) of NBG. It is the policy of the DoD to make lands accessible to the public for educational and recreational use of natural and cultural resources when such access is compatible with the military mission activities, ecosystem sustainability, and other considerations such as security, safety, and fiscal soundness. Access to the TU is extremely limited due to military use but the following recreational uses are permitted when operational requirements allow:

- Snorkeling/ swimming/SCUBA diving
- Hiking, bird watching, and other similar non-consumptive uses

Kilo Wharf is in use approximately 265 days a year during which access to Orote Peninsula is not allowed. Terrestrial recreational activities would continue to be limited under the proposed expansion area due to the military mission at Kilo Wharf and the requirement of the ERA to preserve the full range of biological diversity. Recreational activities must be compatible with the primary purpose of the ERA. Currently no roads provide direct access to the Orote ERA TU. There is a 1 mile (2 km) hiking trail which begins near the end of Orote Peninsula. The trail leads through a forested area and through cave bases and terminates at a coral pebble beach.



"Spanish Steps" trail
(Nicole Olmsted NAVFAC 2013)

The Navy does not maintain data on frequency of TU visitation at the Orote Peninsula. The MU is much more accessible by the public via commercial boats. Dive sites are generally accessible to civilians and military by boat. Popular dive sites at the Orote ERA and adjacent areas include Barracuda Rock, Crevice, Blue Hole, The Wall and Spanish Steps. A study was conducted in 2011 to estimate the MU visitor usage. Approximately 24,152 visitors on 3,077 boat trips visit the MU annually, mainly because of the popular dive sites. Over half the boats observed in the reserve were commercially owned (SWCA 2011).

3.5 Future Land Use

Visitor use may increase as a result of the expected influx of military personnel, their dependants, contractors, and visitors to Guam resulting from the proposed military relocation currently under evaluation. However, access will remain limited for natural resources, safety and security reasons.

4 CURRENT CONDITIONS

4.1 Ecoregional Setting

The proposed TU and MU expansion areas provide high quality habitat compared to other areas on Guam. Preserving this habitat is ecologically important for Guam's native flora and fauna sustainability.

4.2 Current Physical and Climatic Conditions

Guam is located 13 degrees above the equator and has a maritime tropical climate. It is characterized as having two seasons. The raining season begins July and ends in November with an average monthly rainfall of 11 inches. The dry season begins in December and ends in June with an average monthly rainfall of four inches. The average monthly temperature ranges from 79-82 degrees Fahrenheit with humidity ranges of 70%-90% (NAVFAC 1984, JRM 2013).

Orote Peninsula's land area has been substantially altered by shaping, dredging, and filling. However, the proposed Orote ERA expansion includes steep limestone cliffs, limestone forests, shoreline benches, and submerged waters that have had relatively minimal disturbance in the last 70 years (JRM 2013). Orote Island has extremely jagged karst limestone features and pits.

4.2.1 Soils

In 1988 the USDA Natural Resources Conservation Service (NRCS) classified the soils on Guam relating to the geology, landforms, relief, climate, and natural vegetation of the island and published the Soil Survey of the Territory of Guam (JRM 2013). Orote ERA has steep limestone slopes that are rocky and have no significant soil development as shown in Figure 6 (NAVFAC 1984). As a result of infrastructure development, large portions of the Orote Peninsula have highly disturbed soils classified as urban. Upland soils are dominated by highly weathered shallow, well-drained volcanic soils (JRM 2013).The proposed expansion area is comprised of Shioya loamy sand at the beach areas, Ritidian-rock outcrop complex on the slopes, and Rock outcrop Ritidian complex at Orote Island.

Shioya loamy sand is characterized by deep and excessively drained soil on coastal strands with low slopes and low elevation. Ritidian-rock outcrop complex has a mix of cobbly clay loam and rock outcrop that is very shallow and well drained with steep slopes

and elevation from sea level to 1,312 feet (400 m). Rock outcrop Ritidian complex is characterized by vertical cliffs and beaches with 50% rock outcrop (exposed areas of white porous coralline limestone) and Ritidian extremely cobbly clay loam. It is shallow and well drained (USDA 1988).

4.2.2 Hydrology

Guam is divided into two hydrogeological areas: the northern limestone province and the southern volcanic highlands. Geologically, the Orote Peninsula is more closely aligned with the northern structural province. The underlying rocks are composed of coral limestone. Orote Peninsula is a raised limestone plateau reaching 190 ft (58 m) in elevation above mean sea level. The plateau slopes eastward to near sea level (MIRC EIS). No areas of surface or ground water exist in the proposed Orote ERA expansion. This area has no watershed value due to the permeable, dense make up of the limestone, steep slopes, and beaches (NAVFAC 1984). The proposed TU expansion area is comprised mostly of steep limestone cliffs and sandy beaches.

4.2.3 Wetlands

There are no wetlands in the proposed Orote ERA expansion.

4.3 Terrestrial Resources

The proposed Orote ERA expansion TU will provide protection for 32 acres of high quality native limestone forest that serves as habitat for species listed as threatened, endangered, candidate or proposed for listing under the Endangered Species Act, and foraging and resting habitat for migratory birds. Preserving the remaining high quality limestone forests on Guam is important because most of Guam's forests have been greatly altered and degraded by invasive species (Helber Hastert & Fee 2007). For example, feral ungulates cause significant damage island wide by damaging plants through rooting and browsing which can lead to erosion, habitat degradation, and failure of vegetation to regenerate. Invasive species impacts are discussed in more detail in section 4.3.4.

4.3.1 Native Flora

Figure 3 shows the vegetation communities for Orote ERA and the proposed expansion area. The forest habitat community on the cliff face and Orote Island is composed of halophytic-xerophytic plants and broad-leaved plants that can withstand the high salt spray, wind, and karst limestone conditions. Native tree species found within the Orote ERA include *Neisosperma oppositifolia*, *Polyscias grandifolia*, *Cocos nucifera*, *Eugenia sp.*, *Cordia subcordata*, *Pandanus dubius*, *Padanus tectorius*, *Heritiera longipetiolata*, *Intsia bijuga*, *Tournefortia argentea*, *Scaevola taccada, Heritiera longipetiolata*, and *Cycas micronesica* (NAVFAC Pacific 2010). Orote Island supports Guam's largest known population of *Heritiera longipetiolata,* a relatively rare endemic forest tree listed as endangered by Government of Guam.

Herbaceous plants include *Tradescantia zebrine*, *Procris pendulata*, *Phyllanthus sp.*, *Ipomea pes-carpae*, *Canavalia sp.*, *Calicarpa candicans*, *Colubrina asiatica*, *Vitex trifolia*, *Terminalia littoralis,* and *Colubrina asiatica* (pers comm. Grimm 2013).

A vegetation survey was performed along a transect near the Orote ERA on the peninsula. Two-thirds of the relative density was composed of native species, including the Mariana Islands endemic species *Neisosperma oppositifolia, Aglaia marianennsis* and *Tabernaemontana rotensis*. Absolute cover was highest for native upper canopy tree species including *Ficus prolixa*, *Pisonia grandis*, and *Tristiropsis acutangula* (NAVFAC PACIFIC 2010).

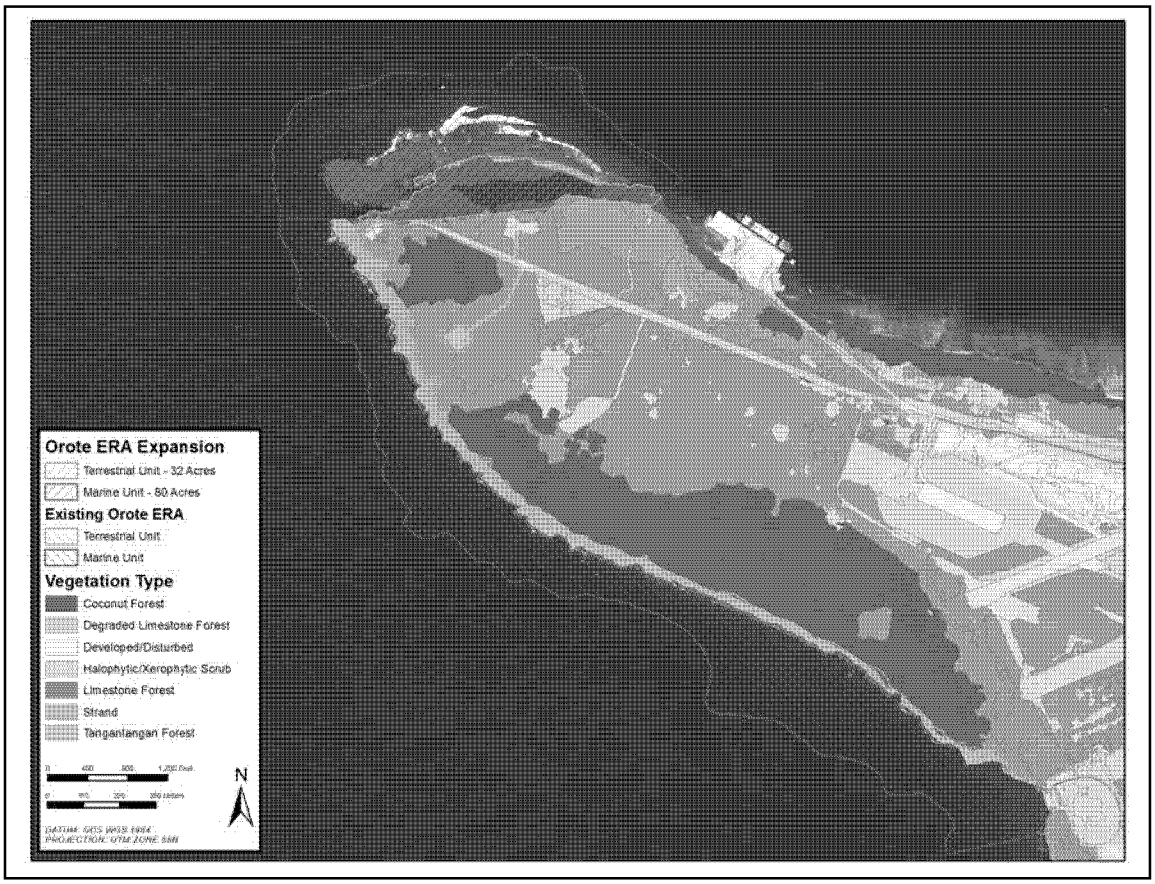


Figure 3. Orote ERA and Proposed Expansion Vegetation Communities

4.3.2 Native Fauna

The proposed Orote ERA expansion provides habitat for native fauna, including federally listed and candidate species. The general species found in this area are discussed in this section and special status species are discussed in section 4.3.3.

4.3.2.1 Invertebrates

Native land hermit crabs (*Coenobita sp.*) and coconut crabs (*Birgus latro*) are present within the proposed Orote ERA expansion along the coastal areas. Coconut crabs are indigenous to the Mariana Islands and are an important wildlife resource culturally and ecologically. Adult coconut crabs may help in seed dispersal of native tree species (Helber Hastert & Fee 2007). The native butterfly *Papilio polytes* is also present in great numbers in the proposed area. Males utilize flora material from *Tournefortia argentea* (pers comm. Grimm 2013).

4.3.2.2 Reptiles and Amphibians

Herpetofauna surveys were conducted in 2008-2009 on NBG. Four native herpetofauna species were documented on Orote Point: blue-tailed skink (*Emoia caeruleocauda*), mourning gecko (*Lepidodactylus lugubris*), stump-toed gecko (*Gehyra mutilata*), and the historically naturalized monitor lizard (*Varanus indicus*). No native amphibian species exist on Guam (NAVFAC Pacific 2010, JRM 2013).

4.3.2.3 Migratory Birds

All of the migratory sea and shore birds found within the proposed Orote ERA expansion are protected under the Migratory Bird Treaty Act (MBTA). Seabird species occur at coastal islets, reef flats, and open oceans around Guam. Common migratory birds observed in the proposed Orote ERA expansion include black noddies (*Anous minutus*), yellow bitterns (*Ixobrychus sinensis*), white tern (*Gygis* alba), brown noddies (*Ancus stolidus*), brown boobies (*Sula leucogaster*), pacific reef heron (*Egretta sacra*), and Pacific golden plovers (*Pluvialis fulva*). The black noddies are found along the shores on Adotgan Rock in high numbers (Helber Hastert & Fee 2007). Brown noddies nest and roost on steep cliffs, rocky offshore islets and channel markers in Outer Apra Harbor. Nesting colonies are located just off the end of Orote Peninsula and on two small emergent rock islands off the north and south coast of Orote Peninsula. It is thought that this is the largest colony remaining on Guam (JRM 2013).

4.3.2.4 Mammals

No native mammal species have been identified in the proposed ERA expansion recently. Historic fruit bat colony roosts have been reported from forested cliffline habitat at Orote Point. In 1971, a colony of 150 fruit bats was observed at Orote Point (Wheeler 1979); this is the last record of a large fruit bat aggregation on NBG. Incidental sightings of single fruit bats or pairs of bats have been made on NBG; but four days of fruit bat surveys conducted in the Orote ERA in 2008 did not detect any fruit bats (Brooke 2008), although suitable habitat exists.

4.3.3 Special Status Species

This section only discusses the special status species that occur or potentially occur within the proposed Orote ERA expansion.

4.3.3.1 Federal Threatened and Endangered Species

Currently no Critical Habitat is designated in the proposed Orote ERA expansion for any species.

Green Sea Turtle

The federally listed threatened green sea turtle (*Chelonian mydas*) nests on Guam beaches. Foraging and resting green turtles are often seen near Guam's well-developed seagrass beds and reef flats. The beach west of Adotgan Beach, part of the proposed Orote ERA expansion, is a known nesting location.

Sea turtle nesting beach at the proposed ERA expansion area (Nicole Olmsted NAVFAC 2009)

Hawksbill Sea Turtle

The federally listed endangered hawksbill sea turtle (*Eretmochelys imbricate*) nests sporadically on Guam. The proposed Orote ERA expansion may provide potential breeding or foraging habitat.

4.3.3.2 Candidate Species

Mariana Eight-Spot Butterfly

The Mariana eight-spot butterfly (*Hypolimnas octocula mariannensis*) is a candidate species for listing by the USFWS. This butterfly species is endemic to Guam and Saipan and results of surveys conducted in 1996 found adult Mariana eight-spot butterfly species at Orote Point (JRM 2013). Larvae of this species were observed on host plants, *Elatostema calcareum* and *Procris pedunculata*, in 1995; both host species are present within the proposed expansion area (Schreiner and Nafus 1996).

Guam Tree Snails

Surveys conducted in 1920 by Crampton (1925) detected two species of partulid tree snails in the Orote Point area, the humped or Mariana tree snail, *Partula gibba,* and the Guam tree snail, *Partula radioloata*. The population was skewed heavily toward the Guam tree snail. In 1989, Hopper and Smith resurveyed Crampton's former Orote Point site and found only one species, the Guam tree snail (Hopper and Smith 1992). The current status of this population is not known.

4.3.3.4 Guam Listed Species

Heritiera longipetiolata

Heritiera longipetiolata is a flowering plant that is listed as endangered by the Government of Guam. The highest known population of this species on Guam is located within the proposed Orote ERA expansion area.

4.3.4 Invasive Species

Invasive species are one of the main threats to Guam's biodiversity. A major factor in the current occurrence and distribution of all wildlife, including ESA and Guam-listed species, is the presence of the brown tree snake (BTS). The BTS adversely affects the economy, human health and island ecology of Guam. Predation by BTS poses the greatest threat to native avifauna and is largely responsible for the extirpation and extinction of many of Guam's forest birds (Helber Hastert & Fee 2007). Preliminary research indicates that the loss of birds as seed dispersers will have a long term impact on forest regeneration and biodiversity island wide (Rogers 2011). The population size and distribution of BTS in the Orote ERA is unknown. Other invasive herpetofauna observed in the forested area include the curious skink (*Carlia fusca*) and cane toad (*Bufo marinus*).

Invasive plants include *Mikania micrantha, Tradescantia pallid, Passiflora suberosa,* and *Chromelina odorata.*

The Asian cycad scale (*Aulocaspis yasumatsui*) has killed native cycads (*Cycas micronesica*) throughout Guam since its introduction in 2003 (Marler 2012). The scale is present within the Orote ERA as it has spread island-wide except for small pockets in southern Guam (Terry and Marler 2005). Native cycads are an important component of the vegetation community and used to be the most abundant tree species on Guam (Marler 2012). However, based on a six year study by Marler, the scale has caused a 100% mortality rate in seedling and juvenile plants (height range of 1-100 cm) in the study area. In mature trees (taller than 100cm) mortality reached 50% until January 2007 and the death rate has been sustained since then.

The coconut rhinoceros beetle (*Oryctes rhinoceros*, CRB) was first detected on Guam in 2007. It has now been detected throughout the island including the Orote ERA. It is one of the most damaging insects to coconut palms (*Cocos nucifera*). Although it is primarily found on coconut palms, it has been detected on betelnut (*Areca catechu*) and *Pandanus* species. It is also known to attack banana, taro, pineapple and sugar cane (USDA 2011).

Feral pigs (*Sus scrofa)* have been found in increasing numbers on NBG (JRM 2013). Recent observations would indicate damage from pig rooting in the area above Spanish Steps (per comm. Grimm 2013). Steep clifflines can act as a natural barrier to ungulates (particularly for feral pigs); therefore the topography by nature in Orote ERA and the proposed expansion area affords some protection from ungulate damage. Signs of the non-native Philippine deer (*Cervus marianus*) have been noticed (Helber Hastert & Fee 2007). Rats, feral cats, musk shrews, and house mice are presumably present at the proposed ERA expansion, but information is lacking on distribution and population density.

4.4 Marine Resources

The existing MU of Orote ERA is currently on the U.S. Marine Managed Area Inventory. The Western Pacific Regional Fishery Management Council has designated all the waters surrounding Guam as essential fish habitat (EFH) from the shoreline to depths of 1,300 feet (Western Pacific Regional Fishery Management Council 1998). The Council has also designated Habitat Areas of Particular Concern (HAPC) for Coral Reef Ecosystem Management Unit Species at Orote Peninsula. The MU has duel designations as HAPC and ERA.

Marine habitats are vitally important to the economy of Guam, particularly the fisheries, recreation, and tourism industries. In addition, Guam's marine environments hold strong cultural, educational, and research value, while providing coastal protection. Marine ecosystems on Guam are threatened by a variety of factors including: habitat destruction, invasive species, development, resources exploitation, climate change, marine pollution and debris, siltation, and typhoons (USFWS 1994, Kelty and Kuartei 2004, Porter et al. 2005, Burdick et al. 2008).

Previous studies have found the coral communities in the MU are more biologically diverse and healthy compared to other sites on Guam (Paulay et al. 2001 and SWCA 2009). A remarkable 1,252 species of marine macrofauna (taxa usually > 1 cm in size) have been recorded in the waters off the southern part of Orote Peninsula, encompassing the proposed Orote ERA MU expansion, including 339 species of fish and 156 species of coral (Paulay et al. 2001). A coral reef assessment for Guam was completed by the University of Guam Marine Laboratory in 2005. The reefs within the Orote ERA were determined to be in fair condition (Porter et al. 2005).

4.4.1 Coral Species

In November 2012, NMFS proposed to list 66 species of corals as TES and 24 of those species occur or potentially occur within NBG as shown in Table 2 (JRM 2013). Future studies will need to be performed to provide additional information on the proposed coral species.

Table 2. Coral Species proposed for listing at Naval Base Guam

Species Name	Status
Acanthastrea brevis	Proposed Threatened
Acanthastrea ishigakiensis	Proposed Threatened
Acropora aculeus	Proposed Threatened
Acropora acuminata	Proposed Threatened
Acropora aspera	Proposed Threatened
Acropora palmerae	Proposed Threatened
Acropora striata	Proposed Threatened
Acropora vaughani	Proposed Threatened
Acropora verweyi	Proposed Threatened

Alveopora fenestrata	Proposed Threatened
Anacropora puertogalerae	Proposed Threatened
Anacropora spinosa	Proposed Endangered
Barabattoia laddi	Proposed Threatened
Euphyllia cristata	Proposed Threatened
Millepora foveolata	Proposed Endangered
Millepora tuberosa	Proposed Threatened
Montipora caliculata	Proposed Threatened
Montipora lobulata	Proposed Threatened
Pavona diffluens	Proposed Threatened
Pectinia alcicornis	Proposed Threatened
Pocillopora danae	Proposed Threatened
Pocillopora elegans	Proposed Endangered
Porites horizontalata	Proposed Threatened
Seriatopora aculeata	Proposed Threatened

4.4.2 Fish

Hundreds of marine fish species have been observed in the MU. The families of wrasses (*Labridae*) and damselfishes (*Pomacentridae*) are the most common. Other well represented families included triggerfish (*Balistidae*), surgeonfish (*Acanthuridae*), squirrelfish (*Holocentridae*), butterflyfish (*Chaetodontidae*), jack (*Carangidae*), and goatfish (*Mullidae*). Two species of sharks, the blacktip (*Carcharhinus melanopterus*) and the reef whitetip (*Triaenodon obeseus*), have been recorded in the MU (SWCA 2009).

5 NATURAL RESOURCES MANAGEMENT STRATEGY & PRESCRIPTIONS

5.1 Purpose and Approach for Management

Both the TU and MU of the proposed Orote ERA expansion can be adversely affected in numerous ways. Threats and stressors that currently or potentially could adversely affect the environment include human activities and natural events. Human activities involve coastal development, runoff, illegal fishing, hunting and trapping, oil spills, introduction of invasive plant species, and water sports. The overall goal for management of the ERA including the proposed expansion is to ensure that its natural resources are protected from physical, biological, and human induced threats and stressors that result in adverse changes to the ecological characteristics. In order to achieve this goal, a more active management approach will need to be implemented. In 2010, an Orote Peninsula Ecological Reserve Area General Management Plan was developed for Naval Base Guam for the existing Orote ERA. Management objectives, strategies, and tasks are designed and focused on invasive species removal, hunting/collecting restrictions, restoration, increased research, monitoring public access, reducing oil spills, and adaptive management. The Orote ERA General Management Plan (GMP) will be updated to include the proposed expansion area into the projects that will need to be implemented to

protect the existing conditions. JRM is in the process of finalizing the INRMP to develop projects and strategies to ensure environmental compliance with no net loss to the military mission. All projects planned for implementation in the Orote ERA GMP should be in alignment with the Final JRM INRMP. Current projects at Orote ERA include one FY13 project to remove non-native plants to improve nesting habitat from federally listed sea turtles. A marine monitoring study is also in progress to provide baseline coral reef species and water quality information for Apra Harbor which includes the proposed expansion area. A more active management approach will be necessary to preserve the biological diversity within the TU and MU habitat. The JRM INRMP contains several strategies for protecting sensitive areas that will be incorporated into an updated Orote ERA GMP.

5.2 Terrestrial Habitat Management

Terrestrial habitat management may include more detailed vegetation surveys, native tree restoration, invasive species control, and ungulate management. Currently, efforts are underway to control feral ungulates on NBG using multiple control methods, including trapping, snaring, and fencing. Preventing ungulate damage to the limestone forest will distinguish the habitat quality within the Orote ERA compared to the rest of Guam's degraded forests. The goals of the JRM INRMP include restoring and enhancing habitats for native species, including listed species, and coordinating with resource agencies. Long term ecosystem-based management plans will direct the development of studies and projects. A list of potential projects and management goals are summarized below.

5.2.1 Forest Management

- Conduct studies to further understand the distribution, abundance, and life history of native trees
- Reduce rooting and trampling of plants by feral ungulates
- Understand the relationship between host plant and candidate species butterfly and tree snail
- Promote the growth of native flora
- Reduce habitat fragmentation

5.2.2 Invasive Species Management

- Control the spread of invasive species per guidelines in the JRM INRMP
- Investigate viable biological control agents to control cycad scale to restore populations of *Cycas micronesica*
- Remove invasive plant species
- Trap BTS, ungulates, and coconut rhinoceros beetles in the area and determine the best methods of landscape level control
- Address prevention of the introduction of potential invasive species

5.2.3 Soil Conservation

- Remove ungulates to help prevent erosion

5.2.4 Threatened and Endangered Species and Special Status Species

- Protect threatened and endangered species and special status species by enhancing habitat and reducing key threats
- Minimize predation, human disturbance, habitat fragmentation, and invasive plants
- Conduct beach cleanups to remove debris from sea turtle nesting habitat
- Monitor population distribution, abundance, and life history information to develop better management strategies

5.2.5 Migratory Bird Management

- Conduct consistent migratory bird surveys to provide a better understanding of avian diversity within the Orote ERA during their migratory paths to develop management strategies
- Enhance habitat and control predation

5.2.6 Pest Management

- Finalize and implement the NBG Integrated Pest Management Plan (IPMP) which will encompass all activities regarding the importation, handling, storage, use and application of pesticides

5.3 Marine Habitat Management

5.3.1 Coastal and Marine Management

Goals for coastal and marine management include establishing a baseline of fish, coral, algae, and marine invertebrates in the MU to evaluate the long-term effectiveness of management strategies. Fishing is currently prohibited within the existing Orote ERA but catch and release fishing is permitted outside the boundary. The current management plan for the Orote ERA will need to be evaluated and potentially modified to restrict fishing within the proposed expansion area if deemed appropriate by the installation Natural Resource personnel. The management plan will also need to be revised and updated to evaluate the current impacts on the submerged ecosystems, identify sources of impacts, and recommend management directed at addressing impacts with the long-term goal of restoring and enhancing submerged ecosystems for native species and corals in these habitats over the next 30 to 50 years. In-water surveys to determine sea turtle distribution and habitat use are recommended. Management should continue to support research on the ecology of green and hawksbill sea turtles and conduct studies to identify migration patterns and nesting trends of hawksbill and green sea turtles.

5.4 Environmental Awareness, Education and Outreach

Education and awareness are important aspects of protecting the natural resources in the proposed Orote ERA expansion. Projects may include:

- Providing Navy Morale Welfare and Recreation (MWR) and Marine Corps Community Services (MCCS) offices with educational and informational materials to assist in developing awareness of natural resources issues, including fishing restrictions

- Collaborating with local dive shops and other tourist agencies to educate tour/dive operators on natural resource issues and implement "reef friendly" diving and snorkeling practices
- Implementing and conducting natural resources education classes for all incoming DoD personnel stationed on Guam and their dependents

5.5 Enforcement of Natural Resources Laws and Regulations

The Navy may hire Conservation Law Enforcement Officers to increase security on Department of Navy lands. This increased security presence may reduce the likelihood of illegal events, such as poaching, occurring on base.

5.6 Beneficial Partnerships and Collaborative Resource Planning

GovGuam established five Marine Protected Areas (MPA) in 1997. The MPAs share similar characteristics to the Orote ERA and there have been significant increases in fish density within the preserves (Porter et al 2005). Coordinating efforts between NBG and the GovGuam may streamline management objectives and project implementation.

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